Successes and Failures of Indian Science

Saga of Science since Independence

The Editorial note of last month dealing with the several instances of administrative lapses was somewhat sickening making one despair whether our country had a good future at all. This month I have the more pleasant task of introducing to our readers a book by Pushpa Mitra Bhargava and Chandan Chakravarti – 'The Saga of Indian Science since Independence'. Pushpa Bhargava is well known in scientific circles as the architect who built the Centre for Cellular and Molecular Biology at Hyderabad. He has been assisted by his capable assistant whose role in building the centre was crucial.

The book is divided into two unequal parts. Part I brings a short account of science development up to independence, a brief summary forming prelude to what follows – the development of science in the post-independent scenario from 1947 to 2001. India perhaps is the only country with a documented scientific history extending for nearly 2000 years. 500 years ago it was the world leader in astronomy, chemistry, medicine, surgery, botany, geology, metallurgy and perfumery!

Causes of Successes and Failures

Our successes, Bhargava attributes to (a) our power of observation, (b) drawing inferences and establishing correlations and (c) learning from trial and error. As regards power of observation, Bhargava states that nothing that could be observed with the naked eye seem to have escaped the notice of early Indians. As a nation, however, we seem to have lost this ability in recent years. While listing the successes Bhargava does not gloss over our failures. The lack of tradition of questioning, the lack of democratization of knowledge kept closely preserved, the amalgamation of religion and dogma with scientific truth, the lack of inflow of knowledge from outside, the codification of knowledge in Sanskrit, making it inaccessible to the majority and the lack of tradition of experimentation – these were some grave shortcomings and as a result he argues that the scientific method never really took deep root in India. Those of us engaged in the practice of science should, while taking note not merely of the successes drawing inspiration from them, but keep our eyes broadly open to some of the glaring failures which have affected our scientific progress.

Bhargava makes the pertinent observation that at the dawn of independence, the country was, in science, very nearly contemporaneous with the west in terms of quality. Perusing the list of persons who were leaders during the period is like going through the hall of fame. Most of them were really great and all were visionaries.

Agencies and Organisations of Research in the Country

The second and most important part of the book commences with the agencies and organizations of research and forms a brief and useful summary of the scope of work in the various Departments of Science and Technology dealing with India.. The Department of Space easily ranks as the most successful among the new scientific departments. There were a number of scientific departments already set up privately but after the organization of the Department of Science and Technology, these units have been taken over, although allowed to function as autonomous bodies like the Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR), Council of Scientific and Industrial Research (CSIR), Department of Atomic Energy (DAE), Department of Science and Technology (DST), Department of Electronics (DOE), Department of Ocean Development (DOD), etc. A glaring omission in this brief coverage has been the work carried out by the Geological Survey of India (GSI) – one of the oldest scientific departments of the Government of India dating back to 1851, in geological mapping and in bringing to light many of the mineral resources of the country. A brief mention is made of the Survey of India (SOI) with an equally enviable record of topographical mapping of the entire country and valuable geodetic observations.

Brief descriptions of professional scientific societies like the Indian Science Congress are provided but the fact that the major professional scientific societies have not been able to create a lobby amongst the politicians and decision makers is glaring. The voice of scientists making technological comments is seldom heard and taken note of while taking decisions. Annual meetings are like fairs where you have a forum for exhibiting only your lobbying skills. The meetings have become too large to allow a serious in depth discussion or to provide opportunities for establishment of close personal contact between research workers.

Because of professional leadership provided, smaller group of specialists have separately organized themselves and have established unconventional traditions. The participants stay for the entire duration of the meeting, no slides or formal reading of papers are allowed and

participants are required to speak extempore in the style of a dialogue or conversation rather than of a lecture Such meetings have a vital role to play in the country and we wish more and more of them are held in all the growing disciplines of science as they can be successful if there is proper leadership and a sense of discipline among the participants

Status of Science Academies

As regards the academies, Bhargava labels them as institutions, intellectually sterile, having made virtually no contribution to the development of science or the discipline they represent within the country Moreover, with the outgoing council of the Academy, the highest body, nominating the incoming council, no radical changes in its working are therefore possible

Status of Indian Scientific Journals

About the scientific journals, he is quite harsh in his judgement saying 'the quality of our journals is known world wide to be extremely low Among the 1871 primary scientific professional journals only 10 are listed in current contents Our journals are read by very few and play virtually no role in the progress of science world wide The best papers contributed by Indian scientists are published in International journals the quality to quantity ratio in Indian science is abysmally low perhaps the lowest in the world '

Progress in Self-sufficiency

One praiseworthy development to which the authors draw attention is the degree of self-sufficiency the country has attained in production of a rich variety of goods, including cars, refrigerators, television sets, computers and calculators, heavy machinery, electrical goods, textiles, locomotives, aircraft, drugs and super alloys and a whole range of items of every day use Quite a few are exported

The country has developed capabilities for executing complicated construction jobs, steel plants and oil refineries, and has secured such works while facing stiff international competition

In several fields, India has advanced so much as to cause marked revolution, agriculture (green revolution), milk production (white revolution), launching of satellites (space revolution), the construction of nuclear reactors (atomic energy revolution) and in several other fields which could never have taken place in pre-independent India Notable accomplishments in the various fields are described, giving an idea of the extent of development that has taken place

Failures in Science

Prominent attention has been paid to a list of our failures which forms an important section of the book (Chapter 5) The more significant of the listings are briefly summarised

> Quality of Ph D thesis is extremely poor and devoid of originality
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> The greatest drawback is the absence of accountability on the part of scientists heading departments If there had been accountability many departments should have been dead now with greater commitment and expertise to have an appropriate working system in place and to make it work in the larger interest of the country in the surviving ones
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> As regards appointments, selection committees are scared of selecting professionaly outstanding people who are also good leaders – independent, courageous and articulate with undisputed integrity and honesty – who would not allow themselves to be patronized The same holds true of assessments and promotions
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> Expensive instrumentations have been created but no system to maintain them or to ensure their proper use They therefore lie unused or are unavailable for legitimate use to others
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> Cases of gross misconduct by way of plagiarism are glossed over The case is quoted of a professor at the Punjab University who had faked fossils brought from second hand shops and passed them off as genuine involving many foreign scientists in the bargain None of the academies and the university grants commission failed to take any corrective action In any other country he would have been dismissed
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> One has to agree with the authors that our scientific commitment to values has progressively decreased since independence
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> Fear of victimisation has prevented the reporting of such cases The overall environment in the country which condones, encourages, and supports financial, social, intellectual and moral corruption, with few checks and balances, is responsible for the continuance of such a situation
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> Science has not played an important role in rural development None of the problems affecting the poor, poverty eradication, health and prevention of disease, rural water supply, instrumental methods of improving agricultural practices has been attacked Research conducted on aspects of relevance have not been communicated, scientists remaining in their ivory tower failing to interact with the common people, trying to understand their problems and finding solutions to them Rural sanitation, management and utilization of waste – all of these need scientific help It is desirable to have a rural technology cell in our technological institutes

The authors, being closely connected with molecular biology, genetic engineering and related studies have many constructive suggestions to offer in pursuance of those studies

In Chapter 6, which analyses reasons for failure, the authors have a novel way of looking at things. A good part of the failures is attributed to lack of education in a large part of the people.... This situation has left 95 per cent of our gene pool unutilized. Therefore, in the last five decades we have lost on both the counts: of having many in science who should have never been taken into it as a career and excluding those who would have done well and increased our base of excellence.

The authors condemn in a forthright manner 'short cuts' to power in which scientists indulge – they often resort to plagiarism, lies, and falsification of results, suppression of excellence, sycophancy and the like, without any fear of retribution. Since the really capable and outstanding ones would not resort to such short cuts and manipulation of power, they are left behind. This is why we have a crisis of leadership in science today – bad leaders in science are worse than no leaders! Committees are formed for the selection of head of an organization, but those who recommend such an appointment are never held responsible for the failure of the appointee. Although an enormous number of scientists are looking for jobs it has become difficult to fill senior positions if one is not willing to compromise with respect to quality. 'There is no serious effort on the part of the government to put excellence at a premium. The budget for scientific institutions is not performance- or promise-based. It is largely on other considerations. There is a lack of reasonable, merit-oriented, discriminatory funding when there are financial constraints.'

Lack of Accountability, a Great Hindrance to Progress

The lack of accountability affects the entire government and not necessarily only the scientific community. '*There has been as a rule no real accountability – social, professional or even financial – on the part of the Directors of scientific laboratories or the heads of scientific agencies. We have systematically protected the incompetent, the ineffective, the corrupt and the sycophantic and made things difficult for the truly outstanding and honest scientists who only seek their right to work and desire no favors. These scientists form into a group of their own – the scientific mafia and tolerating excellence only to the extent along with which they themselves will not be excelled'.*

The advice of scientists is not sought by the government in power in any matter of public importance and they have ignored the Scientific Adviser to the Government of India. There is no lobby of responsible scientists in the corridors of power.

The authors complain of lack of professionalism amongst most of the scientists in the country. Coupled with the high level of inefficiency on the part of the majority of them who take up administrative positions, this lack of professionalism leads to pathetic situations in the running and managing of scientific institutions.

As in other fields of government there is no imposition of accountability by government on the scientists. Why should there not be any attempt, the authors ask, at a review periodically by an international group of experts. This has never been done in an effective manner and such initiatives should have come from the scientists themselves.

Popularization of Science

The authors lay great emphasis on popularization of science – 'The popularization of science and the creation of scientific temper in the country is of utmost significance and importance for the healthy growth and promotion of science. Once this is effected on a large scale India will imbibe the spirit of science and be able to make a major contribution to science itself'.

Commercialization of Education

The authors contention is that our educational system has kept 95 per cent of our gene pool unutilized as the extensive reservation system has worked against the development and propagation of excellence.

Educational institutions as means of money-making is a concept that has developed in India in the last half century after independence. Education has not only been commercialized but politicized and appointments of Vice-Chancellors have become political appointments and their standards have fallen very low.

A proposal is made to take steps to build on our successes and to take note of our failures. The resurrection of traditional knowledge especially in the conservation of water is emphasized and they want a policy of basic research to be worked out so that India could become a leader in such research. Second and third rate research, often of repetitive and imitative character, is to be discouraged.

There is need to recognise and list the problems according to their priority. 'In our country education, water, energy and corruption are at the top of hierarchy of problems. We cannot empower our women unless we educate them and provide them with water and energy. The lack of democratization of school education and provision of good education at all levels, the permanent shortage of water and power; and rampant intellectual, moral, professional and financial corruption in all sectors of our society have acted as a major impediment to scientific and technological progress of the country.'

'Unless we device a policy for using science and technology to provide increased productivity in the agricultural sector and additional income to those engaged in the sector, the dream of an affluent India will remain just that – a dream '

Statistical data is so old as to be meaningless As regards mineral statistics, data for 1998 99 is provided in the year 2002 What is the value of such statistics?

I would have liked to quote more from the writings of the authors and their remarkable analysis of what is ailing Indian science but enough has been stated to wake up our scientists and make them think One last quotation and I will stop

'Just visit the toilets and the kitchens of headquarters of some of our scientific departments in Delhi and you wonder what kind of results would come out of the labora tories under these agencies if their scientists maintained their laboratories (which they often do) at the same standard?'

Future Outlook

As regards future outlook the authors consider it bright They find there is increasing public debate and a climate of improvement is being created, which would be conducive to the development and nurturing of excellence Sustained leadership of high quality is needed They also welcome the emergence of a large number of non-governmental organisations that have highly committed group of people associated with them and a worthwhile agenda

Summing up their thesis, the authors state

'The credit for the successes in science in the country goes largely to (a) the Government of India for its continuous support to science after independence, in spite of its many faults and fallacies, and (b) to the efforts, commitment, courage, intellectual status, integrity, honesty, and scientific excellence of a handful of individual scientists who have been the builders of science and of scientific institutions in post-independence India However, this number is extremely small, particularly, when one takes into account our population, our scientific manpower, and the extent of our scientific effort '

'The responsibility for whatever desirable should have, and could have happened in India but did not (for example, no Indian working in India receiving a Nobel Prize), lies largely with our scientists and, to a much smaller extent, with the Governments for not seeking accountability from the scientists it has appointed and supported, for putting up unwarranted obstacles in the path of out-standingly brilliant and creative individuals, and for forgetting that scientific creativity cannot be ordered but needs to be nurtured '

'Credit must go to a handful of enterprising individuals who had extraordinary scientific and/or managerial ability and acumen, a spirit of adventure and entrepreneurship, ability to weave their way through the maze of difficulties created by the Government and the bureaucracy, and confidence in themselves '

The authors conclude that 'the last fifty years of our history has brought a tremendous change in almost every conceivable area of national endeavour, including science – a change that has been both qualitative and quantitative and which has thrown up many challenges '

'Governments everywhere will need to shed their executive responsibilities, which would need to be shared by responsible private enterprise (including the industry), non-governmental organizations, and professional organizations that are bound to grow with the increase in specialization in all fields The Government s responsibilities would have to be primarily policy-making, supportive, regulatory and legislative It must ensure that whomsoever the Government supports, is held accountable financially, professionally, and socially To achieve such accountability, the Government will have to acquire greater understanding of the nature, structure, and function of modern science and technology '

'There would have to be a people s movement to ensure that everyone in our society has access to education, that our education is barrier-free, and that as we go through the process of education, we not only acquire the expertise of the highest quality in our chosen area but also acquire basic knowledge in all the necessary areas to face the increasingly complex and multifaceted challenges of life in this century '

It is good augury for science that for the first time, scientists of the status of Puspha Bhargava and Chandan Chakravarti have come out with a frank and critical appraisal of the success and failures of Indian science Points made out by them are quite valid and if those in the seats of power take note of these criticisms and try to reform the system much good is possible The authors are deserving of a deep debt of gratitude from all those involved in the pursuit of science and those involved in administration A free and frank debate especially of our shortcomings is to be very much desired so that a healthy research environment could be created in the country 'The wisdom of the past, the direction of the present and the uncharted and yet to be conceived approaches of the future must be brought into full view'

B P RADHAKRISHNA